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translation of the introductory part on mathematical geography in addition to the regional chapters. Nevertheless, in the latter there are occasional striking passages. Chapter 16 (p. 180), for instance, begins with a clear exposition of the processes of erosion and the genesis of mountains:

"In philosophical works it is explained how, earth and water being mingled together, from the viscosity that is in the earth, the heat of the sun causes the same to harden, thus turning it to stone even as fire bakes the clay-brick. But the sun's heat then beginning to act on the stone, this loses its hardness and is broken up; which process continually accelerated by the succession of many nights and days cracks appear, splitting the rocks, which same are thus again turned to earth. Then by the action of earthquakes mountain peaks are demolished, while by the blowing of the winds and the running waters the soft earth is carried from one place to another, yet all that is rock and hard soil will remain fixed, whereby heights and hollows are formed, and it is these heights that are the mountain ranges."

In Chapter 18 (p. 200) there is an account of the origin of springs from rain water that contrasts very favorably with the fabulous hypotheses on this subject current in Europe at the time. There is not a little incidental weather and climate lore, and the cause of the tides in the "Seven Seas" is ascribed to the moon, although in the "Circumambient Ocean" Mustawfī believed in but one yearly tide, produced by the sun alone. Certainly Ḥamd-Allāh was not averse to recording in immense detail all kinds of geographic marvels and monstrosities, but they serve to set off rather than detract from the brilliance of those gems of accurate observation and precise thought that are embedded in the pages of this work.

THE POPULATION OF INDIA: CONDITIONS AND TENDENCIES ACCORDING TO CENSUS STATISTICS

P. K. WATTAL. **The Population Problem in India: A Census Study.** vii and 83 pp. Bennett, Coleman & Co., Ltd., Bombay, Calcutta, and London, 1916. 1 rupee. 8½ x 5½ inches.

The author—is he a native of India?—sees the population increasing faster than the means of subsistence and believes the only remedy is "voluntary restraint in married life." But of this he has no hope.

The two-thirds of the Indians who are Hindus have the economic misfortune to be required by their religion to marry and beget sons. For they take their religion seriously. All but four per cent of the women between 15 and 40 years are married or have been married. For all India the percentage is six, for the Mohammedans largely follow the example of their Hindu neighbors. In every thousand Mohammedan girls under five years of age five are married, among Hindus 18. In every thousand between five and ten years for Mohammedans 65 and for Hindus 132 are married. Between the ages 15 and 40, 860 of a thousand Hindu women and 837 of a thousand Mohammedans live in matrimony. Forty-seven per cent of the population is married, almost exactly eight per cent more than the United States.

The Indian birth rate of 39 in a thousand is one of the highest in the world. So is the death rate of 34. The poverty of the people is extreme. The loss of children by death is little lamented, provided it does not leave the family without sons. There is no emigration from the country to speak of, and so little migration that barely nine per cent of the population are enumerated away from their birthplace. Seventy per cent of them are engaged in agriculture on little holdings of an acre or so per capita. The number engaged in manufactures is falling off as factories become more numerous, for the machines introduced displace many more hand workers than they occupy. Indian industry is in the transition stage. The factory hands do not move to town with their families but leave the family on the land while they work in town, so that large towns like Bombay are apt to have a great disproportion of men in their population. These factory hands look forward to a return to the land. The town exercises no attraction on them apart for the high, steady wages. But, as the number employed is diminishing, industry cannot be said to be directly increasing the national means of support.

It has been said India has much waste land to reclaim, especially by new works of irrigation. Wattal questions this. He finds figures proposed by different writers both for and against. He thinks there is less available land than commonly reported, except in Assam and Burma, and that further irrigation is of nearly prohibitive cost.

Indians of all ages have far less expectation of life than Englishmen in England; worse still, the Indian expectation has been diminishing these twenty years while the Englishman's has been increasing. In 1911 an Indian 20 years of age had a life expectation of 27.5 years—one year less than he had in 1901. The Englishman of the same age in the same period had increased his expectation from 41 to 43.7 years.

It is a sad picture. Not all the census figures are sad though. One table shows wages in India between the years 1900 and 1912 rising from 119 to 166, while the average of prices had only risen from 122 to 141. In England in the same period wages rose from 100 to 103 and prices from 100 to 109. Wattal thinks this peculiar though he has no reason to doubt the figures. Another datum that troubles him is the number of people to a house. It has fallen during the last three decades from 5.8 to 5.4, 5.2, and 4.9. Surely that is a gain.

Another comforting fact that the author does not mention is that the census shows Indian population growing at the rate of 2,000,000 a year, 8,000,000 since the book was written, and still it has found subsistence. If the limit of food is near, surely there must be evidence on every hand in India that famines are more frequent and that life is harder than formerly: the author offers none.

However, his main point is beyond doubt. India has too high a birth rate.

Mark Jefferson

Town Planning in Ancient India

C. P. Venkatarama Ayyar. **Town Planning in Ancient Dekkan.** With an Introduction by Patrick Geddes. xxi and 199 pp. The Law Printing House, Madras. $2.00. 7 x 5 inches.

A collection of references to town and house construction in the old Tamil writings, with comments by the author. One can hardly say that old Dekkan did any town planning. There were some habitual features. Different arts and trades had streets to themselves. The elephant trainers had broad avenues to exercise their animals. The temple tended to be a central feature; and, except in river towns, there was an ample tank of drinking water containing sufficient water even if the monsoon failed. This was commonly bordered by trees and gardens, in which beauty was prized but "sanitation" was sought—in an oriental way. Punnai trees were planted by the seashore, because this tree grows "in sandy soil. Its smell keeps off the bad odours of fish." Trees bearing nutgalls were valued for planting alongside the water tanks because the tannin in their fruit gives a "slightly sweet taste to the water and thus masks any excess of chlorine in drinking water."

Mark Jefferson

Volcanoes of Eastern Bali

G. L. L. Kemmerling. **De Vulkanen Goenoeng Batoer en Goenoeng Agoeng op Bali.** Maps, diagrs., ills. *Jaarboek van het Mijnwezen in Nederl. Oost-Indië,* Vol. 46, 1917, Part I, pp. 50–77. Batavia.

Kemmerling's account of the two volcanoes on Bali is preceded by a study in the same yearbook (pp. 1–48) of a destructive earthquake by which the southern side of that beautiful island was visited in January, 1917. It may be here noted briefly that the earthquake had an undulatory motion and is ascribed, not to volcanic action, but to structural deformation between the up-raised chain of islands and the deep floor of the adjacent Indian Ocean. It is reported that 74,000 buildings, or 90 per cent of the total number, were overthrown or injured, 1,358 persons were killed, and 1,060 wounded. Great damage was done by landslides, of which a number of good views are given, in unconsolidated volcanic deposits on the sides of ravines and on the inner ring-wall slope of the Batur (Batoer) caldera.

Both the volcanoes described are in the eastern part of Bali. Gunung (Mount) Agung, or the Peak of Bali, is a fine young cone of regular form, 3,142 meters in altitude, with a summit crater ½ kilometer in diameter; the long exterior slopes, largely built of lavas, are little dissected. The Gunung Batur mass, farther west, is much more complex. It consists primarily of the remains of a great cone, the top of which has broken down to caldera form, but the caldera is now more or less filled with the products of later eruptions; the down-wash of recently erupted material from the exterior slopes of the remnant cone has largely contributed to the aggradation of the piedmont lowlands. The caldera bears the marks of two engulfments; the earlier one produced a ring wall of elliptical outline, 13.8 and 10 kilometers